Graduate Student Research Assistant Recruitment Notice

The NASA GSFC Office of STEM Engagement is currently recruiting graduate students to apply for the NASA Climate Change Research Initiative (CCRI).

Graduate Student Research Assistant Stipend: $11,700

Application Period: Applications are considered upon receipt and the application period closes on August 29, 2021.

The NASA Climate Change Research Initiative (CCRI) is a year-long opportunity for Graduate Student Research Assistants to work directly with NASA scientists and lead research teams in a NASA research project associated with the science related to climate change at the NASA Goddard Space Flight Center in Greenbelt, MD or NASA Goddard Institute for Space Studies (GISS).

Graduate Student Research Assistants must be willing to commit to the year-long fall, spring and summer program whose dates are defined below. This program is not available for a single term or session. This opportunity will not conflict with the graduate student's coursework or class schedule during the fall and spring semesters and is considered to be a part-time position that supports the graduate student's major area of study.

During the fall and spring term of CCRI the research team will consist of NASA Principal Investigators who will lead Graduate Student Research Assistants and high school STEM educators to become immersed in a NASA science research area of study related to the study of climate change. Fall and Spring sessions will have a time commitment of 10 hours per week for a period of 10 weeks.

During the summer session, the primary research team will add an undergraduate intern and high school intern to the CCRI research team. The Graduate Student Research Assistant works collaboratively for 40 hours per week for a period of eight weeks to complete the research project and to create a scientific research paper and a PowerPoint presentation; a scientific poster will also be presented at the NASA Goddard Space Flight Center and/or NASA Goddard Institute for Space Studies and other regional sciences symposiums.

Virtual / In-person Programming

Due to impacts related to the COVID – 19 pandemic, the fall session will be conducted remotely. Spring and summer session locality requirements will be determined in accordance with the NASA Emergency Response Framework prior to the onset of each subsequent term.

Program Dates:

Fall: 10/11/21 -12/17/21: (10 hours per week for 10 weeks)

Spring: 02/07/22 – 04/15/22: (10 hours per week for 10 weeks)
Summer: 06/20/22 - 08/12/22: (40 hours per week for 8 weeks)

Requirements:

- Applicants must be in a graduate level degree program that aligns with the project that is being applied to
- Must have US citizenship

Application Submission Process

We are using BOX to collect application documents from candidates. A folder has been created for 2021 Fall CCRI Graduate Student Research Assistants. Applicants are required to submit a cover letter, resume, transcripts and letters of recommendation, following a naming convention as detailed on the next sections.

Application Procedure: To apply for the Graduate Student Research Assistant Recruitment position, please submit an application inclusive of a cover letter, resume, transcripts and letters of recommendation to: 2021 Fall CCRI Graduate Student Research Assistants.

The cover letter should include:

- Description of how the project being applied to aligns with the graduate student's course of study
- Detailed description of technical skills (programming languages if applicable)

Please make sure to use the following **naming convention** for your application files:

Last Name First Name Cover Letter
Last Name First Name Resume
Last Name First Name Transcript_1
Last Name First Name Transcript_2 (If you have more than one transcript)
Last Name First Name Graduate Advisor Letter of Support

For questions regarding this opportunity, and any other questions related to the Climate Change Research Initiative, please contact Matthew Pearce.

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NEW - Research Project Description: Developing New Understandings of the Environmental Impacts of the Changing Urban Fabric in a Changing Climate (GSFC)

Mentor: Dr. Eric Brown De Colstoun

Duty location: NASA Goddard Space Flight Center

Project Description: Urban areas are principal agents of change across our home planet. In an increasingly urbanizing biosphere, scientific understanding, and societal adaptation each require tools to accurately measure and monitor the dynamics and environmental consequences of the urban ecosystem. With over half of the world's population living in urban areas today—projected to grow to 68% by 2050—these tools, data, and scientific understanding will make significant contributions to national and international policies to ensure the sustainability of cities and settlements in the face of a changing climate. While urban areas still represent today a small proportion of Earth's land surface, urbanization can have significant impacts on hydrological cycles and microclimates of local and surrounding areas up to regional and even continental scales.

New, more detailed, and more accurate remotely-sensed data on urban areas and associated built-up surfaces can provide a foundation for a better understanding of the impacts of cities on their environment and potential improvements in the modeling of the impacts of urbanization on the energy/water/carbon cycles. The unprecedented level of spatial detail in these new data sets allows for a much improved and accurate characterization of the urban fabric (e.g., roads, buildings, open space), and their change, at a spatial scale that is directly relevant to cities and settlements and their inhabitants. This project will leverage existing and future NASA remote sensing assets to study in detail the direct connections between changes in the urban fabric and environmental changes in the Baltimore/Washington DC study area and the Chesapeake Bay Watershed. The aim is to develop, test and assess data and methodologies regionally but with potential applicability to other areas of the world. Successful applicants will work closely with the mentor and associated scientists at NASA Goddard Space Flight Center to perform work in the following suggested areas:

- Assess quality and accuracy of the harmonized Landsat and Sentinel 2 data set for urban change monitoring in the Baltimore/Washington DC area (see https://hls.gsfc.nasa.gov/).
- Develop methods and assess useability of NASA Lidar remote sensing (e.g., satellite/airborne) for urban vertical structure.
- Assess useability of Landsat and ECOSTRESS satellite data for monitoring the urban heat island effect.
- Use Very High Resolution commercial satellite archive at NASA for urban change detection and vertical change.

- Perform field studies using field measurements and the GLOBE Observer mobile phone app (see https://observer.globe.gov/) to assess accuracy of data sets above. This work will involve local schools and high school students.
- Develop maps or other cartographic products using NASA satellite data over the Baltimore/Washington DC region.
- Work with local stakeholders to communicate science and to build capacity to use new data sets for local/regional applications.
- Communicate findings with science community via presentations and written work.
- Participate in NASA research proposals and publications as appropriate.

***NOTE: There is NO expectation that applicants will perform ALL the above activities as these are listed as suggested areas for work. There is a strong potential to participate in several active research areas and to be involved in future NASA research projects.

Preferred Technical Skills for Graduate Student Research Assistant: Experience with satellite remote sensing systems, data processing and analysis, and applications are desired but not required. Experience with mapping tools such as Geographic Information Systems (GIS) and/or Google Earth Engine desired as well. Computer programming skills in Python, R, C, C++ or other modern computer languages are a plus as is knowledge and experience with analysis tools such as MatLab. Educators applying for this position are not required to have expertise in these programs but should have a willingness to engage with them as determined by the mentor.

Preferred Major Course of Study: Geography, Cartography, Applied Mathematics, Applied Physics, Computer Science, Data Science, Urban Planning, Environmental Sciences, Climate Science, Earth Science and Engineering are encouraged to apply. Students attending Historically Black Colleges and Universities, or Minority Serving Institutions are encouraged to apply.

Skills Desired: This is a great opportunity to be an active contributor to a team working on the future of Urban Remote Sensing at the NASA Goddard Space Flight Center. Ability to work well independently (under mentor supervision) as well as in teams is necessary. Desire to work and communicate with local teachers and students is very important. Attention to details and schedule are also important as are good communication and interpersonal skills.

Research Project Description: Characterizing the Urban Land Surface Temperature via an Innovative, Multi-Platformed Suite of Satellite and Ground-Based Remote Sensing Technologies (GISS)

Mentors: Dr. Reggie Blake & Dr. Hamid Norouzi

Duty Location: NASA Goddard Institute for Space Studies; CUNY-City College of Technology

Project Description: In light of climate change, urban micro-climates, the urban heat island effect and other urban geophysical phenomena and processes, there is a new urgency to better study, understand, and characterize urban environments. Revolutionary and innovative ideas are being

considered to transform the study of the urban landscape. Fundamental changes are taking place in geophysics and in engineering to aid in the adaptation and mitigation of the environmental challenges to which cities must respond.

For this project, students will perform a local, intensive, and comprehensive surface energy balance data collection and processing initiative that will help to characterize the urban heat island, the heat index, and more particularly the land surface temperature over various local community built and natural environments. The project aims to produce high temporal and spatial resolution land surface temperatures for the local community and for New York City using the combination of satellite remote sensing observations and ground-based measurements. Students will obtain remote sensing data from multiple polar orbiting and geostationary satellites. Additionally, students will use infrared cameras and flux tower instruments to understand how urban surfaces react to solar radiation and its consequent heat. Students will be able to monitor the incoming and outgoing radiation and heat energy components using the cameras. The differences between traditional rooftop materials and new green or white roofs will be explored. Moreover, hand held temperature measuring devices, Unmanned Aerial Systems (UAS), and observations from satellite infrared observations will be collected. Using statistical approaches and data processing, the gaps in temporal and spatial coverage appropriate for the development of a heat index (effect of air temperature + humidity) will be filled. The volume of data used in this project is expected to in the range on 5TB. The added-value of this initiative is that cross-pollination between students and the local community and the transfer of knowledge between the two groups will be created and sustained long after the project ends.

Project Activities Include:

- Monitoring thermal characteristics of urban surfaces such as concrete, asphalt, rooftop, and vegetated surfaces at different seasons and times of the day by collecting data
- Coordinating with community partners to receive skin temperature measurements from various surfaces in the local community.
- Obtaining and analyzing satellite land surface temperature observations from geostationary and polar orbit satellites such as from the Geostationary Operational Environmental Satellite-R Series (*GOES-R*), LandSat, Ecostress, Sentinel 2A, the Moderate Resolution Imaging Spectroradiometer (MODIS), etc.
- Analyzing the collected data to define and to develop a high spatial resolution (10 m) and high temporal resolution (every 5 min) skin temperature over the local community and over New York City using several statistical approaches by fusing satellite based and ground observations.
- Developing an online interactive server platform to disseminate the data to the local community and to scientists. Data visualization and queries will be among important features of the proposed platform.
- Working closely with the local community on the use of the collected data to interpret and predict the strength and extent of heat wave events.

Preferred Major Course of Study: Applied Math, Computer Science, Data Science, Environmental Sciences, Earth Science, Physical Science, Climate Science and Engineering are encouraged to apply.

Preferred Computer / Technology Skills: Strong computer programming in environments such as JAVA, Python, Matlab, R, or experience with Google Earth Engine is preferred.

Research Project Description: Climate Change in the Hudson Estuary – Past, Present & Future (GISS)

Mentor: Dr. Dorothy Peteet

Duty Location: Lamont Doherty Earth Observatory; NASA Goddard Institute for Space Studies

Project Description: The Hudson Estuary is comprised of key tidal marshes, which serve to provide many ecosystem services to the large population of this important coastal region, including NYC. These services include fish nurseries, coastal protection, water purification, paleoclimatic archives, and carbon sequestration repositories. We seek to understand the records of past droughts, cold intervals, floods, and vegetation shifts along with the past shifts in carbon storage. From this information, we can better understand our present snapshot of climate/carbon, and predict future accumulation rates as climate warms and sea level rises.

Preferred Major Course of Study: Biology, Earth Science, Paleoecology, Environmental Science

Preferred Computer / Technology Skills: Interest and desire to learn paleoclimatic skills, including field and lab research as well as data analysis. Field research includes plant identification, sediment coring, and sediment probing. Skills include processing samples including Loss-on-ignition, carbon content, x-ray fluorescence, and pollen and macrofossil identification. Botanical background a plus, along with past microscope experience and use of Excel.

Research Project Description: Earth Observation Applications for Resiliency – Assessing Climate Change Impacts in Urban, Agricultural, and Natural Environments (GISS)

Mentor: Dr. Christian Braneon

Duty Location: NASA Goddard Institute for Space Studies

Project Description: The history of Earth observation began in the 1840s, during the era of geographical exploration, when pictures were taken from cameras secured to the tethered balloons for the purpose of topographic mapping. It took another 100 years for earth observations to evolve to a platform based in space called satellites. Remote sensing is the science of obtaining information without physically being in contact with it. This process involves detection and measurement of radiation at different wavelengths reflected or emitted from distant objects or materials, by which they may be identified and categorized.
Through various remote sensing platforms such as satellites and aircraft, supplemented by surface and subsurface measurements as well as modeling and mapping, practical information about Earth's physical, chemical, and biological systems can be obtained. We seek to help urban

stakeholders, agricultural leaders, and conservationists respond to the challenges presented by a changing climate by transforming a wealth of NASA Earth observation data (e.g. Landsat, MODIS) into actionable information.

Preferred Major Course of Study: Applied Math, Computer Science, Data Science, Environmental Sciences, Climate Science, Earth Science and Engineering are encouraged to apply.

Preferred Computer / Technology Skills: Computer programming experience in environments (such as JAVA, Python, Matlab, R) and/or experience with Google Earth Engine is preferred.

Research Project Description: Atmospheric Rivers in a Changing Climate (GISS)

Mentor: Dr. Allegra LeGrande

Duty Location: NASA Goddard Institute for Space Studies

Project Description: Atmospheric River events cause dramatic flooding along the western coast of the USA and populate our news headlines. These phenomena occur globally and are responsible for ~80-90% of meridional moisture fluxes in the mid-latitudes and 30-40% of meridional moisture fluxes in the Arctic. In the Arctic, moisture fluxes associated with ARs have been proposed as a means for polar amplification through latent heat fluxes as well as downwelling thermal radiation. For this project, students will use simulations from the NASA Goddard Institute for Space Studies ModelE, version 2.1 (GISS-E2.1, CMIP6) enabled with suite of tracers to diagnose the moisture source for Atmospheric River events to contrast with climatological moisture sources and amounts. Simulations will be evaluated for skill in the modern/historic period. Further simulations and analysis will then be performed with an augmented suite of simulations of both past and future climate to determine the impact of climate change on AR events.

Preferred Major Course of Study: Computer Science, Earth Science, Geoscience, Paleoecology, Data Science

Preferred Computer / Technology Skills: Python, NCL, Matplotlib, C, C++, Fortran